National Institute of Environmental Health Sciences

A validated genome wide association study to breed cattle adapted to an environment altered by climate change

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Abstract:

Continued production of food in areas predicted to be most affected by climate change, such as dairy farming regions of Australia, will be a major challenge in coming decades. Along with rising temperatures and water shortages, scarcity of inputs such as high energy feeds is predicted. With the motivation of selecting cattle adapted to these changing environments, we conducted a genome wide association study to detect DNA markers (single nucleotide polymorphisms) associated with the sensitivity of milk production to environmental conditions. To do this we combined historical milk production and weather records with dense marker genotypes on dairy sires with many daughters milking across a wide range of production environments in Australia. Markers associated with sensitivity of milk production to feeding level and sensitivity of milk production to temperature humidity index on chromosome nine and twenty nine respectively were validated in two independent populations, one a different breed of cattle. As the extent of linkage disequilibrium across cattle breeds is limited, the underlying causative mutations have been mapped to a small genomic interval containing two promising candidate genes. The validated marker panels we have reported here will aid selection for high milk production under anticipated climate change scenarios, for example selection of sires whose daughters will be most productive at low levels of feeding.

Source: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2722733

Resource Description

Exposure :

weather or climate related pathway by which climate change affects health

Food/Water Security, Food/Water Security, Temperature

Food/Water Security: Livestock Productivity

Geographic Feature:

resource focuses on specific type of geography

None or Unspecified

Geographic Location:

resource focuses on specific location

Non-United States

Non-United States: Australasia

Health Impact: ☑

specification of health effect or disease related to climate change exposure

Health Outcome Unspecified

Intervention: ☑

strategy to prepare for or reduce the impact of climate change on health

A focus of content

Mitigation/Adaptation: ☑

mitigation or adaptation strategy is a focus of resource

Adaptation

Population of Concern: A focus of content

Population of Concern: ☑

populations at particular risk or vulnerability to climate change impacts

Workers

Resource Type: ☑

format or standard characteristic of resource

Research Article

Resilience: ☑

capacity of an individual, community, or institution to dynamically and effectively respond or adapt to shifting climate impact circumstances while continuing to function

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Timescale: ☑

time period studied

Time Scale Unspecified

Vulnerability/Impact Assessment: ☑

resource focus on process of identifying, quantifying, and prioritizing vulnerabilities in a system

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